

DIVISION OF FOREST PEST CONTROL



Northeastern Area State & Private Forestry

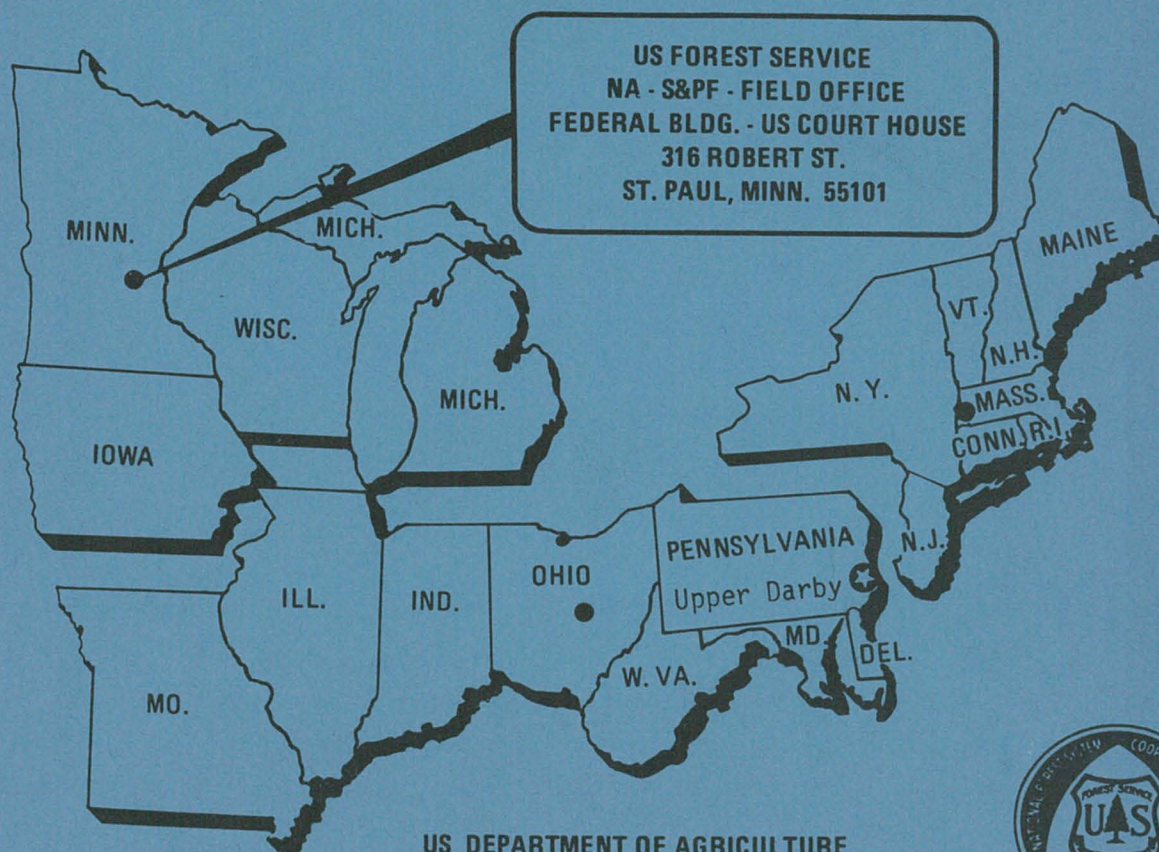
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RED-HEADED PINE SAWFLY DAMAGE SURVEY ON THE CADILLAC
RANGER DISTRICT, MANISTEE N. F., MICHIGAN

By Imants Millers



US DEPARTMENT OF AGRICULTURE
FOREST SERVICE



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ABSTRACT

More than 100 red pine plantations in 6 Townships on the Cadillac Ranger District were surveyed for red-headed pine sawfly damage. Systematic surveys were made in 16 plantations where significant sawfly activity had been found. Ten plantations have 10% or more trees with sawfly damage; 4 plantations have 5-9% trees infested; and 2 plantations have less than 4% trees infested. The St. Paul Field Office Forest Pest Control Staff recommend that the plantations be left untreated to determine sawfly damage impact.

INTRODUCTION

The red-headed pine sawfly is an important defoliator in red pine plantations. The colonial feeding habits of the larvae result in concentrated feeding on branches and trees. Resurgence of the red-headed pine sawfly was reported in 1968 and further increase noted in 1969. The present report covers a survey made of all susceptible red pine plantations in 6 Townships on the Cadillac Ranger District.

BIOLOGICAL REVIEW

The red-headed pine sawfly, Neodiprion lecontei (Fitch), in the Cadillac area is found mostly on red pine, Pinus resinosa Ait. The sawfly larvae feed in colonies on the needles from July until late August. Complete defoliation of a branch or a tree causes mortality of the defoliated part. One or two living needles surviving near the bud appear sufficient for the survival of the branch. However, mortality of most of the branches is likely to result in the death of the whole tree. Parasites, predators, diseases, and adverse weather have been claimed as causes for sawfly population declines, but quantitative data are not available to show the cause-effect relationships. Most of the biological information on the red-headed pine sawfly is reported by Benjamin (1955).

SURVEY METHODS

The general boundary of the outbreak area was determined from surveillance reports submitted by the Cadillac Ranger District staff. Forest Service plantations with trees between 2 feet and 10 feet in height were surveyed within Townships T21N, R10 and 11W; T22N, R10, 11 and 12W; and T23N, R10W.

All Forest Service plantations, with red pines between 2 feet and 10 feet in height, were examined for sawfly damage. First, a rapid survey was made through a plantation to detect and estimate sawfly damage. When less than 5% of trees were found with sawfly feeding, the plantation was considered safe from serious damage. An intensive systematic survey was made when 5% or more trees had sawfly damage.

For the intensive survey, a minimum of 25 sample plots were examined in a plantation. The number of plots was increased in areas over 40 acres in size as follows: 1 additional plot for each 2 acres over 40, and 1 additional plot for each 5 acres over 80. The plots were systematically distributed in a plantation to give broad coverage of the area.

Each sample plot consisted of 4 consecutive red pines in a row. Dead trees were counted only if the cause of death appeared to be from previous sawfly defoliation. The degree of defoliation for each tree was estimated to the nearest 10%; previous and current defoliation was recorded separately.

RESULTS

More than 100 plantations, covering about 3000 acres, were surveyed for sawfly damage. Systematic surveys were made in 16 plantations covering 539 acres (Figure 1). Table 1 shows that on the average 11.4% of trees in the 16 plantations were infested in 1969, with an average defoliation of 15.7% per infested tree. In 1970 the average damage has increased and 25.6% defoliation per tree. About 10% of all trees were infested both in 1969 and 1970. The average tree mortality from sawfly damage is 1.4% of all trees.

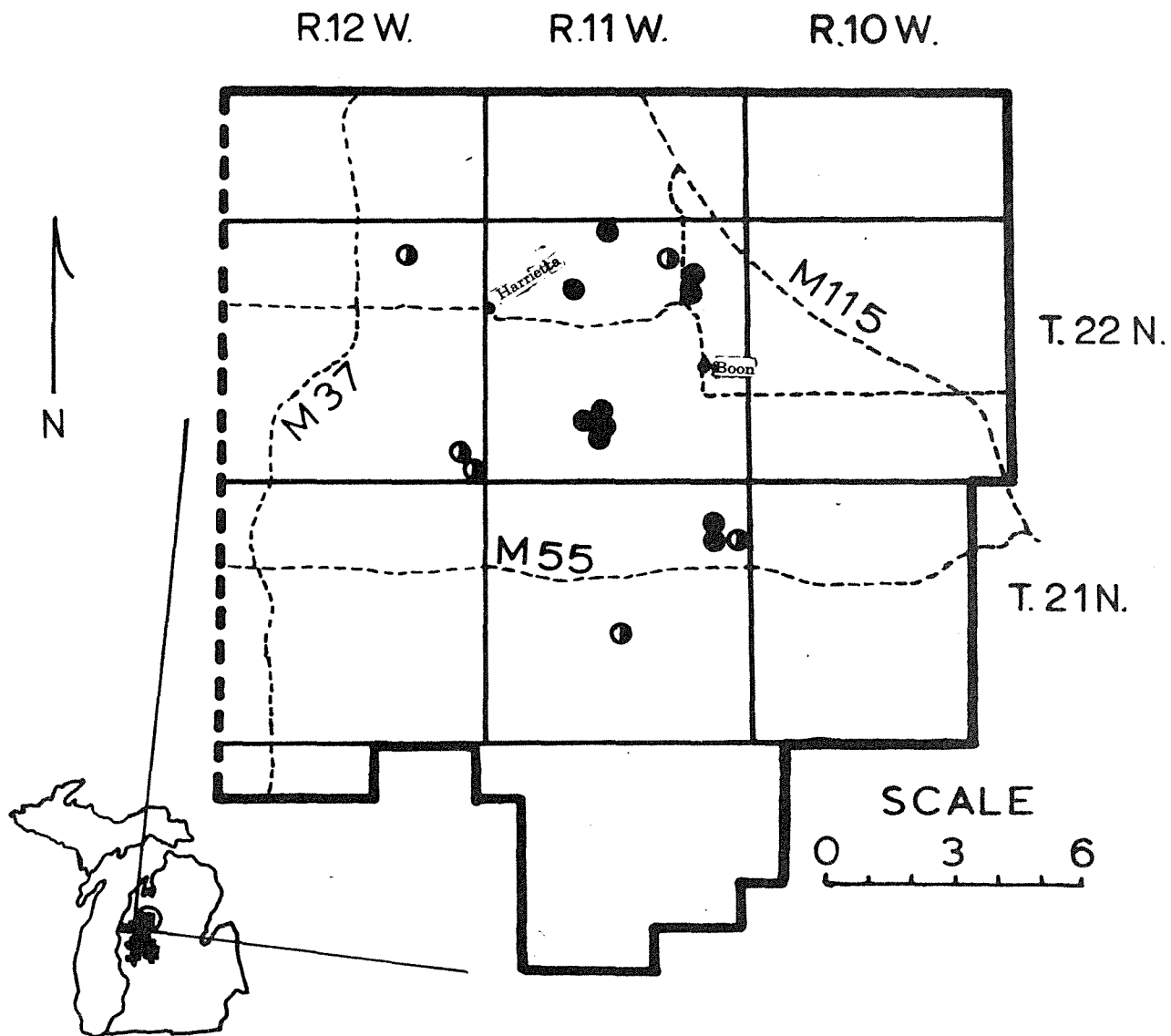


Figure 1. Red-headed pine sawfly infested plantations on the Cadillac R.D., Manistee National Forest. KEY: ● 10% or more trees with sawfly damage; ○ 2-9% trees with sawfly damage.

Table 1. Red-headed pine sawfly infestations on the Cadillac R.D. - 1970

| LOCATION ^{1/} | | | | | TREES WITH DEFOLIATION | | | DEFOLIATION OF DAMAGED TREES | | | |
|------------------------|----|-------|------|-------|------------------------|---------------|--------------|------------------------------|---------------|--------------|-----------------|
| T | R | S | 1/4 | Acres | Tree Ht. Ft. | Previous % | Current % | Reinfested % | Previous % | Current % | Trees Killed |
| 22 | 11 | 2 | SW | 18 | 4 | 1 | 8 | 4 | 15 | 26 | 0 |
| 22 | 11 | 4 | NE | 32 | 4 | 15 | 29 | 14 | 25 | 29 | 2 |
| 22 | 11 | 11 | NWNE | 65 | 3 | 16 | 17 | 13 | 14 | 22 | 0 |
| | | | SWNE | 2/ | 3 | 10 | 14 | 9 | 15 | 17 | 0 |
| 22 | 11 | 8/9 | | 11 | 3 | 15 | 18 | 14 | 27 | 26 | 1 |
| 22 | 11 | 28 | NE | 12 | 3 | 25 | 40 | 25 | 23 | 26 | 10 |
| 22 | 11 | 28 | W | 57 | 3 | 18 | 23 | 16 | 13 | 20 | 1 |
| | | | NWSE | 2/ | 3 | 12 | 25 | 12 | 13 | 22 | 1 |
| | | | SWSE | 2/ | 4 | 18 | 17 | 16 | 16 | 26 | 1 |
| 22 | 12 | 2 | SW | 27 | 5 | 6 | 8 | 6 | 32 | 18 | 0 |
| 22 | 12 | 36 | SE | 50 | 4 | 3 | 2 | 2 | 13 | 15 | 0 |
| 22 | 12 | 36 | N | 50 | 4 | 6 | 4 | 4 | 20 | 32 | 0 |
| 21 | 11 | 12 | NW | 70 | 3 | 15 | 20 | 12 | 28 | 38 | 4 |
| | | | SW | 2/ | 3 | 10 | 10 | 8 | 12 | 32 | 0 |
| | | | SE | 2/ | 4 | 4 | 9 | 2 | 30 | 31 | 0 |
| 21 | 11 | 21/22 | | 147 | 3 | 4 | 7 | 2 | 30 | 29 | 2 |
| Average ^{3/} | | | | 33.7 | 3.5 | 11.4 | 15.7 | 9.9 | 20.4 | 25.6 | 1.4 |

^{1/} T-Township N; R-Range W; S-Section; 1/4 quartersection.

^{2/} The acreage of these plantations are included in the 1st one listed in the section.

^{3/} Not weighted by plantation size.

DISCUSSION

The effects of red-headed pine sawfly caused defoliation on red pine, specifically, are poorly documented. Most forest entomologists in the Lake States have seen dead red pine, apparently the result of complete defoliation by the sawfly. Benjamin (1955) shows a photograph of a sawfly killed red pine, but in the text he provides mortality data only for jack pine and southern pines. However, his introductory statement in the chapter discussing the influence of defoliation on host states:

"In northern United States and Canada, jack and red pines succumb to a single, complete defoliation".

Artificial defoliation of red pine, as well as defoliation by other insects, causes tree mortality (Kulman, 1971). Although, no serious doubt exists that the red-headed pine sawfly kills red pine, documented confirmation in the field is needed.

Similar conclusions can be reached for the effects of defoliation of a branch on a tree. Benjamin (1955) indicates that single branches completely defoliated generally die, although partially defoliated branches frequently survive if a few needles, or living needle stubs, remain near the bud.

Studies near Cadillac, Michigan, provide information on the relationships between numbers of sawflies and the resultant degree of defoliation, as well as the expected number of colonies per tree within a given level of plantation infestation (Benjamin, 1955). Briefly, he shows that small trees 1-2 feet in height can be defoliated by a single sawfly colony, while larger trees require more colonies. In addition, he found that the number of colonies per tree increases with the increase of percentage of trees infested. Flink (Personal communications) has tentative data showing that one sawfly larva on the average defoliates about 1 linear inch of foliated red pine branch. Thus, a colony of about 70 sawfly larvae could completely defoliate about 6 linear feet of red pine branch, approximate amount of foliated branch found on a 3 ft. tree.

Effects of 2 successive years of partial red pine defoliation by the sawfly are not reported. However, reduction of the total complement of foliage and reduction in the length of the needles can be assumed (Kulman, 1971). This will result in net loss of food available to the sawfly colony.

Therefore, a smaller number of sawflies will be needed to defoliate a previously defoliated tree, than a similar size healthy tree. The data in Table I indicate that most of the 1969 trees were reinfested in 1970.

A study is planned to determine the significance of repeated consecutive sawfly defoliation on a tree. This information would improve evaluations of damage caused by sawfly outbreaks.

In cost-benefit analysis, the resource manager needs to know how much he can expect to lose from a given sawfly infestation. Literature is meager in providing this information. Benjamin (1955) reports that 2 sawfly colonies completely defoliated a 2 ft. red pine. In jack pine plantations about 6 ft. tall, he found on the average 1 colony per tree when about 10% of trees had colonies, and up to an average of 2 colonies per tree when about 60% of trees were infested. He also indicates that tree mortality begins when about 10% of trees are infested. This latter observation is supported by field data from Cadillac. However, the land manger needs to know how many trees will die, or will become deformed, from a given level of infestation.

RECOMMENDATION

Chemical control of the sawfly cannot be recommended at this time, because the severity of damage cannot be predicted from available literature. Instead, the FPC staff at St. Paul recommends that an evaluation be made to determine how much resource damage is done by a given level of sawfly infestation.

The field going personnel should be advised to report any new sawfly infestations (use Form NA 5200-1).

LITERATURE CITED

- Benjamin, D. M. 1955. The biology and ecology of the red-headed pine sawfly. USDA Forest Service Tech. Bull. 1118:57 pp.
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